IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: **Koji KAWAGUCHI et al.** Art Unit: **3656**

Application Number: **10/589,620** Examiner: **Phillip A. Johnson**

Filed: **August 1, 2007** Confirmation No.: **3827**

For: **TAPERED ROLLER BEARING**

Attorney Docket Number: **062901**
Customer Number: **38834**

REPLY BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

August 9, 2011

Sir:

In response to the Examiner's Answer mailed June 9, 2011, the following is the Appellant's Reply Brief.

REMARKS

Appellant submits, for the reasons discussed in the Appeal Brief filed on March 29, 2011 and in the below remarks of this Reply Brief to the Examiner's Answer mailed on June 9, 2011, that the Examiner has failed to establish a *prima facie* case of obviousness with respect to any of claims 1 and 2, which are presented for appeal.

Independent Claim 1

Nakagawa et al. fails to disclose or render obvious the features of independent claim 1.

Issue 1:

Appellants submit that *Nakagawa et al.* does not disclose a technical idea, let alone define particular ranges of the total crowning amount and the crowning amount ratios of the outer ring, tapered roller and inner ring to the total crowning amount so as to achieve the presently claimed advantageous effects and unexpected results. Accordingly, it cannot be predicted by *Nakagawa* that rotation torque reduction (effect) is obtained in the claimed ranges of the total crowning amount and the crowning amounts of inner and outer rings and tapered roller (*e.g.,* as indicated in Figs. 6-8 of the present application.)

As pointed out in Appellant's Appeal Brief, *Nakagawa* discloses tapered rollers that are axially moved to be pressed against the cone back face rib face of the inner ring for allowing the tapered rollers to settle in their normal positions. Col. 11, lines 54-58. When the tapered roller contacts the cone back face rib face in this manner, the rolling friction between the tapered roller

and the internal ring increases as a matter of course, resulting in a rotation torque increase (not reduction) of the tapered roller bearing. This leads to the opposite effect as that of the presently claimed invention (*e.g.*, decreasing rotation torque of a tapered roller bearing.) Accordingly, Appellants submit that the reliance on *Nakagawa* is improper.

Appellants submit that the Examiner's Answer does not cure this deficiency. For example, on pages 6 and 7 of the Examiner's Answer, the Examiner states that *Nakagawa* recognizes the crowing amount as a result-effective variable, because the amount of crowning "can be optionally set within the range of 1-6 μm for the rolling surface 3c', 1-20 μm for the raceway surface la', and 1-20 i.trn for the raceway surface 2a' (10-50 μm for compound crowning) ..." for the purpose of ensuring "smooth axial movement of the tapered roller 3 toward the cone back face rib face 2c during the running-in operation and shortens the running-in operation time" (col. 13, lines 9 - 16).

Crowning amount *ratios* and crowing amounts are both positively claimed in the present invention. *Nakagawa* fails to discuss the ratios.

Also, to conceive the features of the present invention on the basis of *Nakagawa*, both (1) claimed ranges of crowning amount ratios and (2) effect of torque reduction must be predicted by *Nakagawa*, despite the fact that this (1) is not mentioned explicitly and implicitly in *Nakagawa*, and (2) is contrary to the objective of *Nakagawa*. Hence, the Examiner's opinion that the present invention is easily foreseeable for persons skilled in the art is unreasonable.

Furthermore, on page 7 of the Examiner's Answer, the Examiner states: "*Nakagawa* does not teach away or disclose any negative results with crowning amounts for the raceway 1a' and

2a' and roller 3c' surfaces exceeding the disclosed ranges. Thus optimizing the total crowning amount or the crowning ratios of the raceway and roller surfaces to the claimed ranges is only a matter of routine skill in the art."

Appellants disagree. The claimed ranges are not obtainable for a person skilled in the art by simply expanding the ranges expressly disclosed in *Nakagawa*. Moreover, there is no supplemental description in *Nakagawa* that suggests or even implies the claimed ranges.

Accordingly, a prima facie case of obviousness has not been presented, because it would not have been possible for a person skilled in the art to predict the above-described features of the present invention based on the cited reference.

Issue 2:

Appellants submit that it would not have been obvious to modify *Nakagawa et al.*, such that the total crowning amount, defined as the sum of crowning amount of outer ring 1, the crowning amount of inner ring 2 and two times the crowning amount of the roller 3 times, is more than 50 μm, and the crowning ratio of the outer ring 1, defined as crowning amount of outer ring 1 divided by the total crowning amount, is 40% or more, and the roller 3 crowning ratio, defined as two times the roller 3 crowning amount divided by the total crowning amount, is 20% or less, "since it has been held that discovering optimum value of a result effective variable involves only routine skill in the art." Office Action, page 3.

In response, the Examiner merely states: "[T]hat fact that the Appellant has a different reason for obtaining the claimed ranges does not indicate that Nakagawa cannot predict or obtain the same claimed ranges for an entirely different reason." Examiner Answer, page 8.

Appellants submit that the Examiner's response is insufficient to legally support a *prima facie* case of obviousness.

As explained in the Appeal Brief: "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575 (Fed. Cir. 1990).

Figs. 6-9 show, for example, the criticality of the claimed range. The inventors conducted verification test(s) (results in Figs. 6-9) to clarify the relationship between the rotational torque of the tapered roller bearing, the total crowning amount, and each crowning ratio. Many different tapered roller bearings were prepared, in which the total crowning amount and each crowning ratio were set to various values, to experimentally measure the resultant rotation torque. **The test confirmed that the rotation torque of the tapered roller bearing decreases** provided that the total crowning amount is 50 μm or more, the outer ring crowning ratio is 40% or more, and the roller crowning ratio is 20% or less.

Nakagawa's roller crowning ratio is **greater than 20%.** As shown in the scatter graph illustrated in Fig. 8, when the roller crowning ratio is 20% or less (claimed range), the torque

ratio stably scatters in a lower-value range in comparison with the case where the roller crowning ratio is more than 20% (*Nakagawa*'s ratio is 23.1%). *See* paragraph [0031].

Nakagawa's outer ring crowning ratio is **less than 40%.** As shown in the scatter graph illustrated in Fig. 9, when the outer ring crowning ratio is 40% or more, the torque ratio stably scatters in a lower-value range compared with the case in which the outer ring crowning ratio is less than 40% (*Nakagawa*'s ratio is 38.5%). *See* paragraph [0030].

Nakagawa does not recognize that satisfying the claimed ranges reduces the rotational torque of the tapered roller bearing. Instead, *Nakagawa* only mentions that arrangement described in the specification and recited partly above (*e.g.,* col. 13, lines 9-13) "ensures smooth axial movement of the tapered roller 3 toward the cone back face rib face 2c during the running-in operation and shortens the running-in operation time." *See* Col. 13, lines 13-17.

Thus, the particular claimed ranges are critical and achieve unexpected results relative to the *Nakagawa et al.* range

Accordingly, a *prima facie* case of obviousness has not been presented, and the rejection of claim 1 should be withdrawn for at least the reasons discussed above.

Dependent Claim 2:

Nakagawa et al. fails to disclose or render obvious the features of independent claim 1.

Issue

Claim 2 properly depends from independent claim 1. In view of the above remarks, Appellants submit that the features of dependent claim 2 are not disclosed or rendered obvious by the cited reference.

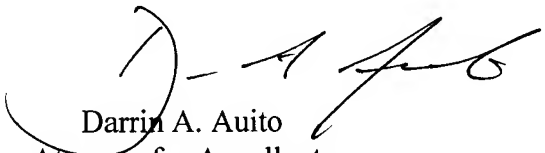
CONCLUSION

Thus, for at least the above reasons and the reasons discussed in the Appeal Brief submitted on March 29, 2011, Appellant requests that the Honorable Board reverse the Examiner's rejection.

If this paper is not timely filed, Appellant respectfully petitions for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP



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